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Sydney School of Architecture, Design and Planning

We acknowledge the tradition of custodianship and law of the Country on which the University of Sydney is located. We pay our respects to those who have cared, and continue to care for, Country.

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We are one of Australia's leading built environment and design schools.\*

For more than 100 years, the Sydney School of Architecture, Design and Planning has fostered a diverse and collaborative environment for teaching, research and engagement. Our academics use ideas from the humanities, science, creative practice, and the social sciences to address modern built environment and design issues, from the design of wearable technologies to urban planning outcomes. We are proud that our people and students reflect the community we work and study in.

\* QS World Rankings by Subject 2023: Architecture & Built Environment



"Many of the world's greatest challenges revolve around cities and digital technology. Through collaboration, creativity and rigour, the school's research inspires transformation on built and designed environments, objects and experiences."

> Professor Robyn Dowling Dean and Head of School School of Architecture, Design and Planning University of Sydney

HOUSING FUTURES

#### ARC Linkage Project

#### RE-CO-DE: Co- and Re-Design of Ageing Apartment Buildings

Sandra Karina Löschke – Associate Professor in Architecture Hazel Easthope – Associate Professor, UNSW Alysson Lucas – PhD Candidate

Industry partners: COX Architecture Government Architect Office NSW AJ+C Architects Lannock MaxBuild

Apartment buildings have become the standard solution for urban living and have been rolled out en masse across Australian cities over the past 50 years. The majority, however, no longer meet current social, environmental, and economic standards. They are wasteful of energy, fail to meet resident expectations, depreciate in value, and are often seen as modernist eyesores that negatively affect perceptions of a neighbourhood. With apartments accounting for 36.3% of households globally and as much as 46.1% in the EU, this scenario represents a significant issue for cities and their residents.

To date, the default answer to this issue has been demolition and new builds. However, research shows that this is often unfeasible or simply irresponsible. Economically, the costs often outweigh benefits while, environmentally, the embodied energy of new construction and demolition waste is totally unsustainable. Socially, new builds also involve displacement and disruption for resident communities.

So, why isn't redesign already a mainstream development option? The main reason is that many apartment buildings are multi-owned and decisions on building need to be made by consensus amongst multiple parties. A participatory approach is therefore necessary but, with no formal process in place, progress is slow, expensive and can frustrate entire projects.

In exploring the redesign of private multi-owned apartment buildings, this research is targeted precisely on this point – the role that participatory approaches play in the design and construction process. It seeks to develop a sustainable model for transforming apartment buildings, turning it into a question of re- and co-design rather than demolition.



Image source: http://www.lacatonvassal.com/?idp=5

ARC Discovery Project

#### The Precarious City: The Suburban Settlement in an Age of Uncertainty

Laurence Troy - Lecturer in Urbanism Bill Randolph - Professor, City Futures Research Centre, UNSW

Two pillars of Australia's post-war 'suburban settlement' are disintegrating – home ownership and income security. The consequences for patterns of urban change are unclear but, drawing on the concept of social citizenship, this project explores them through the life trajectories of 25- to 40-year-olds. We already know that structural changes in employment opportunities are disrupting established patterns of housing demand for this group but new research is needed to deepen our understanding of this process. The new knowledge generated will inform policymakers and wider debates on the breakdown of home ownership, particularly in relation to the longer term implications of that breakdown for the Australian model of citizenship.







# Hidden Housing Crisis? Urban Planning and Informal Housing Supply

Nicole Gurran – Professor, Chair of Urbanism, Director of the Henry Halloran Research Trust Zahra Nasreen – Postdoctorate Housing Researcher Pranita Shrestha – Research Associate



As the pressure of affordability increasingly forces low-income renters into substandard or 'informal' living arrangements, it becomes necessary to uncover how this 'hidden' housing is produced. The housing in question ranges from shared accommodation and backyard 'granny flats' to unauthorised dwelling units. This informality is produced within formal systems of urban regulation and there is an urgent need to investigate the risks or benefits for residents. Seeking to advance research in urban studies and taking a lead in international scholarly collaboration, the aim of the project is to expose the significant but often ignored role of informality within housing systems. Enhancing local planning practice and our knowledge of 'hidden' housing will be crucial steps in improving housing standards and choice for low-income renters.

#### HOUSING FUTURES

ARC Discovery Early Career Research Award

# Hacking Housing: Technologies, Processes and Practices of Housing Futures

#### Sophia Maalsen - ARC DECRA Researcher

Australian experiences of housing are changing due to rising unaffordability, uncertain employment prospects and digital disruptions to the market. The result is a housing system whose diversity is manifested in both supply and demand, with providers and consumers innovating through novel housing models and practices. It might be directed towards finding solutions to housing problems, but contemporary thinking in the field cannot grasp the scale of this reshaping.

In this context, it becomes necessary to advance a new conceptual framework and innovative methodologies to understand the housing landscape as digital, rented and shared. This research is aimed at generating new empirical knowledge and the use of digital methodologies in order to grow international research networks. In a time of uncertainty in housing, the knowledge generated will serve to provide a digital methods toolkit as well as evidence to inform policy-makers.





SMART URBANISM AND INFRASTRUCTURE

> ARC Future Fellowship

# Socio-Spatial Implications of Smart City Development in India

Tooran Alizadeh – Associate Professor of Urbanism and Infrastructure, ARC Future Fellow

Deepti Prasad – Postdoctoral Research Associate, Urbanism

The complex socio-spatial implications of smart city development demand new depths of research and knowledge in relation to two fundamental issues: the question of the right to the smart city in the Global South, and the ways in which smart city developments have been further consolidated, expedited, and elevated in response to COVID-19.

By placing the Southern urban critique front and centre, this socio-spatial research marks a significant contribution to smart urbanism discourse globally. With a focus on equity and its pertinence at times of crisis, it strengthens existing connections – as well as building new ones – between India and Australia in an area of bilateral national significance.

As a core part of the project positioning it at the forefront of research on smart cities, the 'International Alliance of Smart Cities in India' is a collaborative network bringing together scholars from the UK, Singapore, and India. Meanwhile, additional funding through the International SDG Collaboration Program at The University of Sydney (in collaboration with researchers from UCL, TISS and local Indian NGO partners) has allowed for further expansion.



#### SMART URBANISM AND INFRASTRUCTURE

#### ARC Linkage Project

# Digital Technologies and the Private Rental Sector in Australia

#### Dallas Rogers - Associate Professor in Urbanism Sophia Maalsen - ARC DECRA Researcher

Digital technologies have the potential to exacerbate housing inequalities, but they also have the potential to create a better housing system and Australian society. The growth of the private rental market on one hand and the creation of new digital technologies aimed at renters, landlords, and property managers on the other form a nexus sometimes called 'Generation Rent' and 'PropTech', respectively. The intersection of these major changes will have significant impacts on Australian society and calls for significant research and investigation.

The tech industry views the growing group of renters as a new business opportunity, while the real estate tech companies might not even own, or be in the same country as, the physical real estate assets on their platforms. It's a situation that profoundly alters the relationships between properties, landlords, tenancy managers, and renters. Some, like Airbnb, have already begun to change the short- and long-term private rental markets of various cities and neighbourhoods. Working in partnership with the Tenant Union, this project evaluates the potential for innovation among the new digital technology companies targeting the private rental sector. As well as developing a set of housing policy recommendations for different State legislative contexts, it will even more importantly use this data to co-produce a Tenant Advocacy Technology.





# Smart Regional Spaces: Ready, Set, Go!

Nancy Marshall - Associate Professor in Urban and Regional Planning Kate Bishop - Associate Professor, UNSW Christine Steinmetz-Weiss - Associate Professor in City Planning, UNSW Robyn Dowling - Professor, Dean Sophia Maalsen - ARC DECRA Researcher Yuan Wei - Project Officer, UNSW Eshita Dutia - Project Officer

#### ROWS 8 BUN STOP GPS



With a focus on equitable digital inclusion, *Smart Regional Spaces – Ready, Set, Go!* aims to prepare regional New South Wales to be 'smart-ready'. The project is a collaboration between the University of Sydney, University of New South Wales (UNSW) and Department of Regional NSW (DRNSW), along with the regional councils of Armidale, Lithgow, and Parkes local government areas.

By intersecting with the work of these local councils, support is provided for the development of their relationship with data and smart technologies – all with a view to benefitting the local communities. Since councils need context-sensitive smart strategies, they will continue to learn how digital information and solutions can be customised to meet the specific needs of each area.

The program has been designed with a focus on education and awareness training in order to achieve a number of outcomes. It will facilitate councils' interaction with smart cities projects and plans, as well as provide opportunities to share knowledge with other councils and learn from inter/national smart places experts. The project as a whole is set to create a legacy of tools for the other 92 regional NSW councils as they expand digital capabilities.



# Making the Sustainable Development Goals Feasible at Planetary Scale, One City at a Time

Somwrita Sarkar – Associate Professor, Urban Science Chirag Deb – Lecturer in Urban Heat Islands and Energy Modelling David Levinson – Professor of Transport, School of Civil Engineering Arnab Jana – Associate Professor, Urban Science, Indian Institutes of Technology, Bombay Eswar Rajasekaran – Assistant Professor, Remote Sensing, Indian Institutes of Technology, Bombay

The planet will be home to 9.5 billion people by 2050, according to UN predictions. Approximately 68% of humanity will be living in cities and urban areas. Goal 11 of the UN Sustainable Development Goals (SDG) – "Make cities and human settlements inclusive, safe, resilient and sustainable" – requires reliable, accurate data on changes to land use and land cover across the planet, especially its urban areas.

The Sydney School of Architecture, Design and Planning is working with our strategic partner, the Indian Institute of Technology, Bombay, to track urban growth across the planet. Using medium- and high-resolution satellite imagery, in combination with developing advanced machine learning approaches, it's underpinned by the University of Sydney's commitment to a University Sustainability Strategy focused on the UN-SDG goals.

From spatio-temporal longitudinal analysis of changes to built-up areas, road networks, informal settlements, vegetation and green cover to identification of urban heat island effects and urban climate resilience, this is research that will break new ground – above all enabling big data and evidence-driven planning for an urban planet that is sustainable and equitable.

#### The Infrastructure Governance Incubator

Tooran Alizadeh – Associate Professor of Urbanism and Infrastructure, ARC Future Fellow Rebecca Clements – Henry Halloran Trust Postdoctoral Research Fellow Glen Searle – Adjunct Associate Professor in Planning Liton Kamruzzaman – Associate Professor of Transport, Monash Crystal Legacy – Associate Professor in Urban Planning, UNIMELB Dallas Rogers – Associate Professor in Urbanism

The Infrastructure Governance Incubator's research investigates the planning and delivery of urban infrastructure in Australian cities, identifying strengths and gaps in current practices as well as developing integrated infrastructure governance approaches for Australian cities. It involves a focus on the planning, funding, and the social legitimacy of infrastructure, acknowledging contexts of multiple crises and foregrounding the need for First Nations voices in governance. At the core of the Incubator's research is an in-depth case study of Sydney's Western Parklands City informed by 55 interviews with a wide range of stakeholders from different levels of government, the private sector, and NGOs.

With a highly esteemed advisory board including key infrastructure stakeholders from NSW and Victoria, the Incubator's work has also been expanded through co-funded work on public-led smart city approaches with DPIE and through two practitioner-in-residence positions. Tying together many different strands, it's an overall collaborative research project across three universities, funded by the Henry Halloran Research Trust and partnering with the Planning Institute of Australia's NSW and Victorian branches.





#### DESIGNING WITH DIGITAL AND EMERGING TECHNOLOGIES

ARC Discovery Project

# An Interaction Model for Human-Machine Creative Collaboration

Kazjon Grace - Senior Lecturer in Computational Design, DECRA Fellow Francisco Ibarrola - Researcher in Co-Creative Artificial Intelligence Marius Hoggenmueller - Lecturer in Interaction Design Sam Gillespie - Associate Lecturer Liam Bray - Adjunct Senior Lecturer Dan Ventura - Professor in Computer Science, Brigham Young University Ollie Bown - Associate Professor, UNSW Marcus Carter - Associate Professor in Digital Cultures, Faculty of Arts and Social Sciences Alex Elton-Pym - PhD Candidate Shuyao Dai - PhD Candidate Geoffrey Lazarus - PhD Candidate

How can we enhance creative work through interacting with artificial intelligence (AI)? It's a crucial question for our times and addresses an opportunity that is largely unexplored as things stand right now. Amidst black-and-white fears that AI will take over all creative jobs – or indeed excitement that it will solve all our problems – the question of human-AI collaboration provides much needed clarity in the debate around one of the most controversial and pertinent topics of the present moment.

At the core of this project is an aim to show that interactive systems can enhance creative productivity. More specifically, the aim is to demonstrate how this can happen through the development and evaluation of a model for the ways in which humans and AI might interact while creating.

The expected outcome of this work is to generate new strategies for effective, intelligent, and domain-general creativity support. These new strategies will nevertheless be validated in the domains of drawing and music composition by rigorous human-centred prototyping techniques. In working towards a model of creative work through interaction with AI, the benefits will include an increase in the rate of creative outputs – both within creative industries as well throughout the economy as a whole.

ARC Discovery Early Career Researcher Award

# Broadening Horizons: Using Curiosity to Diversify Behaviour

Kazjon Grace - Senior Lecturer in Computational Design, DECRA Fellow Mary Lou Maher - Professor, College of Computing and Informatics, University of North Carolina, Charlotte Hamish Henderson - Adjunct Senior Lecturer Natalia Gulbransen-Diaz - PhD Candidate

Design shapes worlds and behaviours, and at its heart this project explores how interactive systems can encourage their users to try new things. Recent developments in artificial intelligence that can estimate what will make people curious are just one way in which these enquiries are made possible. The expectation is that new ideas will be generated about how interactive technology can encourage diverse behaviour by stimulating curiosity. Building on a greater theoretical understanding of how to diversify user behaviour, these investigations will lead to the creation of a framework for how to design interactive systems that encourage users to try new things.









ARC Discovery Project

#### Trust and Safety in Autonomous Mobility Systems: A Human-Centred Approach

Luke Hespanhol - Lecturer in Design and Computation Stewart Worrall - Research Fellow, Australian Centre for Field Robotics Eduardo Nebot - Emeritus Professor, Patrick Chair in Automation and Logistics, Australian Centre for Field Robotics Jennifer Kent - Senior Research Fellow in Urbanism, DECRA and Robinson Fellow Martin Tomitsch - Professor, Head of Transdisciplinary School, UTS Alexander Wiethoff - Senior Lecturer, LMU Munich Adrian Ellison - Associate Director (Data Science Consulting), DSpark PTY LTD

Australia is seen as a leader in the development and adoption of driverless cars. Australia's Smart Cities Plan highlights that their transformational impact will "fundamentally change how we live and work". Driverless cars and other autonomous vehicles have the potential to contribute to the strategic goals of Australian cities, addressing sustainability and liveability through shared ownership models and reduced congestion. This project contributes to the foundation for autonomous vehicles by focusing on a mostly overlooked aspect: how to make autonomous vehicles sympathetic to the social life of the urban spaces they inhibat. It tackles this challenge by developing new understanding about how autonomous vehicles interact with people around them, and how this is linked to perceived trust and safety. This, in turn, has the potential to reduce the risk of accidents from pedestrians misinterpreting the intention of the vehicle and to improve their public perception. Economic benefits associated with road accidents and trials, as well as indirect cost benefits associated with road

ARC Discovery Project

#### Shared-Space Interactions between People and Autonomous Vehicles

Callum Parker - Lecturer in Interaction Design Stewart Worrall - Research Fellow, Australian Centre for Field Robotics Judy Kay - Professor of Computer Science Eduardo Nebot - Emeritus Professor, Patrick Chair in Automation and Logistics, Australian Centre for Field Robotics Simon Marvin - Professor Marius Hoggenmueller - Lecturer in Interaction Design Martin Tomitsch - Professor, Head of Transdisciplinary School, UTS Tram Tran - PhD Candidate Yiyuan Wang - PhD Candidate

Can technology empower trust and safety in the era of autonomous vehicles? The project investigates whether people are more likely to trust autonomous vehicle technology and feel safe if they are able to understand how the system makes decisions and to directly influence its behaviour.

The project delivers a key component for the success of robotic applications in cities: It develops critical understanding about how autonomous vehicles in urban environments need to interact with the people that they share those spaces with. Australia's world-leading position in mining robotics offers a unique first-mover advantage for Australia to lead the development of autonomous vehicle technology, a market estimated to increase to \$348 billion globally within the next 10 years.

Beyond the domain of driverless cars, autonomous vehicle technology enables new applications, such as transport pods, delivery droids and maintenance robots. The benefits of these kinds of vehicles, which can operate in shared spaces, such as pedestrian zones, include mobility for people with disabilities, delivery of goods in areas that are not accessible by cars and more efficient maintenance of urban infrastructure.

The project contributes to Australia's Smart Cities Plan, which outlines the impact of autonomous vehicles, and the Transport for NSW Future Transport 2056 Strategy, which prioritises "places for people".



#### UI INTERFACE | DESIGN APPROACHES





#### DESIGNING WITH DIGITAL AND EMERGING TECHNOLOGIES

#### Big Data Bugs: Investigating the Design of Augmented Reality Applications for Museum Exhibitions

Anastasia Globa - Lecturer in Computational Design and Advanced Manufacturing Callum Parker - Lecturer in Interaction Design Jude Philp - Senior Curator of the Macleay Collections, Chau Chak Wing Museum

Visitors to a traditional museum space often have an alienating experience – viewing artefacts from behind glass partitions and feeling distinctly separate from the thing viewed. Instead, the augmented reality (AR) application being developed here brings specimens to life, providing audiences with an engaging sensory experience to spatially visualise insect specimens in-situ. It also allows them to view more detailed information through their own devices.

The design is directed towards a web-based and smartphone-augmented reality app for a Chau Chak Museum exhibition. It's based on a co-design approach, in this case on geo-located data for entomology specimens.

The intricate and interconnected nature of data visualised in the proposed AR environment creates both challenges and opportunities. As a start, however, an existing museum collection containing over 300,000 thousand insect and non-insect specimens has been recorded – an enormous data set which contains both existing and obsolete geographic and taxonomic data.

#### Brain, Mind, and Mallett Street: Understanding the Spaces of Mental Health, Neurology and Neuroscience collaboration

Chris L. Smith – Professor of Architectural Theory Donald McNeill – Associate Dean Research, Professor of Urbanism Leigh-Anne Hepburn – Head of Design, Senior Lecturer in Design Innovation Jason Dibbs – Associate Lecturer, Research Associate

In 2020, the Brain and Mind Centre (BMC), a multidisciplinary research institute at the University of Sydney, commenced a collaboration with the School of Architecture, Design and Planning (ADP) on research to better understand the role of spatial design in the delivery of clinical services and research in mental health, neurology, and neuroscience. Since the collaboration's inception, an ADP team consisting of Professor Chris Smith, Professor Donald McNeill, Senior Lecturer Leigh-Anne Hepburn, and Associate Lecturer Jason Dibbs has conducted a range of research and teaching activities with BMC colleagues.

These have included a co-design workshop and a series of semi-structured interviews with stakeholders from the various disciplinary, clinical and research groups working within the BMC's facilities; an intensive design studio for a youth mental health outreach centre; and a graduation thesis studio, 'Head Place,' for Master of Architecture students. The latter focused on the redesign of the former Bonds Factory on Mallett Street, Camperdown to accommodate the various research and clinical activities of the BMC.

In June 2023, Professor Chris Smith and Associate Lecturer Jason Dibbs presented research and teaching outputs from the Brain, Mind and Mallett Street collaboration to the Executive Leadership Committee of the BMC. Research from this collaboration is also published as a book chapter, "Space of Co-Design in Mental Health, Neurology, and Neuroscience" in Design for Mental Health and Wellbeing: Co-Design, Interventions, Education and Policy (Routledge, forthcoming 2023), and in a paper for the Situated Ecologies of Care Conference (Architectural Humanities Research Association, forthcoming 2023).

The collaboration between ADP and BMC remains active, with interview data analysis ongoing and informing other planned research outputs. These include the second 'Head Place' graduation thesis studio and the development of a new collaborative research trajectory exploring the role of spatial design in healthy ageing.





#### Transforming the Palliative Care Patient Journey using Emerging Technologies

Naseem Ahmadpour - Senior Lecturer in Design, Director of the Design Major Phillip Gough - Lecturer in Biological Design, Director of Bio Design Major Philip Poronnik - Professor of Biomedical Sciences, School of Medical Sciences Martin Brown - Project Manager Innovative Technologies Judy Kay - Professor of Computer Science Bob Kummerfeld - Associate Professor, School of Computer Science Melanie Lovell - HammondCare, Palliative Medicine Physician and Senior Specialist, Director of Clinical Trials at Greenwich Hospital Phil Austin - Research Fellow, Osteopath Tim Luckett - Palliative Medicine, IMPACCT Centre, UTS Professor Meera Agar - Palliative Medicine, IMPACCT Centre, UTS Jane Philips - Head of School of Nursing, Faculty of Health, QUT

The COVID-19 crisis provided stark evidence that the ability to maintain health in sustainable yet autonomous ways is crucial for those who are unwell. The crisis highlighted how the needs of people with chronic conditions or those in palliative care were 'invisible'. These factors reinforce the 2018 National Palliative Care Strategy that stressed the need to harness personalised, technologyenhanced, interactive experiences to improve palliative care outcomes.

Amidst this wider context and drawing on the immersive virtual reality platform, the work in this project brings a lens of human-centred design to medical treatment. One of the effects of this is to provide agency to patients in order to better manage physical symptoms and access a wider range of programs involving mindfulness, wellbeing and connectedness. Similarly, solutions for the treatment of chronic diseases such as cancer and neurological disorders will be informed by the work.

ARC Discovery Project

#### The University and the City

Donald McNeill – Associate Dean Research, Professor of Urbanism Dallas Rogers – Associate Professor in Urbanism Mark Tewdwr–Jones – Professor of Cities and Regions, University College London

The relationship between the university and the contemporary city is changing, a critical trend that provides a focus for investigation. Universities play a significant role in urban geography, typically occupying extensive areas of high-value real estate and having accumulated new buildings and facilities over decades. Within a highly competitive student market, university management strives for successful product placement and to integrate their campuses within wider city regions.

Tensions remain, however, between universities and the cities in which they are located, not least the historical sense of the campus as a sheltered space of learning 'cloistered' from the industrial modern city. The ways in which the spatial management of the university interfaces with urban economic development, students, and business and philanthropy are just some of the key topics in question.

Examining how prevailing concepts such as the neoliberal and civic university apply on the ground, a framework for analysing the development of university space is set to be developed. Alongside a qualitative dataset, it's about new tools that can be used by stakeholders in Australia and internationally.



ARC Discovery Early Career Research Award

#### Parenting and Private Car Use in Australian Cities

Jennifer Kent - Senior Research Fellow in Urbanism, DECRA and Robinson Fellow

Australian cities seem fixed on private car dependency and addressing this means providing a thorough theoretical, methodological, and policy framework. The way we travel as parents is a particularly complex expression of private car use, an example used here to combine theories of practice, policy, and process – all with a view towards better understanding transport behaviour. By establishing an evidence base to inform potential and effective policy changes, the aim of this research is to lessen the social, environmental, and economic impacts of private car use. It's based on interdisciplinary and multifaceted understandings of car dependency as well as ways to transition towards more sustainable and healthier modes of travel.





# Towards Restorative Sound Environments in Youth Justice Facilities on Country

Michael Mossman – Senior Lecturer in Architecture, Associate Dean Indigenous Strategy and Services Densil Cabrera – Associate Professor, Director, Audio and Acoustics Program Clare Cooper – Lecturer in Interaction Design Shuai Lu – Lecturer in Audio and Acoustics

NSW has detention facilities for young people which ideally should divert them from future entrenchment in the criminal justice system, putting their lives on a positive course. These facilities present many difficult challenges, not least in terms of acoustics. The question is how their sound environments can be designed to positively contribute to living conditions, rehabilitation and well-being. While Indigenous over-representation in the detainee population demands culturally informed interventions to reconnect detainees with cultural ways, the role of sound will provide a research focus insofar as it contributes to rehabilitation and healing. It will also initiate a broader engagement with Youth Justice NSW and Indigenous realities of Country as healing.

#### HISTORIES OF ARCHITECTURE AND THE BUILT ENVIRONMENT

ARC Discovery Project

#### Locating Giurgola: From Philadelphia School to Global Practice

Cameron Logan - Associate Professor, Director, Master of Heritage Conversation Catherine Lassen - Senior Lecturer in Architecture Andrew Leach - Professor of Architecture Philip Goad - Redmond Barry Distinguished Professor, Chair of Architecture, UNIMELB AnnMarie Brennan - Senior Lecturer in Design Theory, UNIMELB Denise Costanzo - Associate Professor of Architecture, The Pennsylvania State University Paolo Tombesi - Professor of Construction and Architecture, École Polytechnique Fédérale de Lausanne Switzerland William Whittaker - Curator and Collections Manager, University of Pennsylvania

Romaldo Giurgola (1920-2016) was the principal architect of Australian Parliament House (APH) and this project aims to conduct the first major systematic assessment of his architectural career. Set to review all known archives relating to his life and works – including significant collections in North America and Australia – it will survey the full range of his architectural projects. The result is expected to be no less than a new and complete assessment of Giurgola's architecture, figuring important Australian buildings into an international landscape of professional practice. With the production of a large critical catalogue, the full extent of Giugola's career, as well as the particular place of APH within, will be presented in new terms and for the first time.





# The New South Wales Private Property Frontier

Andrew Leach – Professor of Architecture Dallas Rogers – Associate Professor in Urbanism Amelia Thorpe – Associate Professor in Law, UNSW

From the end of the 1780s, the colonial government of New South Wales began to turn parcels of the 1770 Crown land claim into plots, large and small, of private property. With support from the Henry Halloran Research Trust and the Australian Research Data Commons, the Private Property Frontier is testing the means by which a large-scale study of the pattern and pace of that process – that is, alienation – took place over time. Contributing to the Time-Layered Cultural Map of Australia, the pilot study explores the history of land alienation over a series of parishes in New South Wales. When and where was land first considered to be in private hands? What did that privatisation entail? How was it mediated? And what did it allow? The research begins with the observation that the history of Australian architecture is also a history of the relationship between what we build and where we build. Using the tools of the digital humanities, it offers a spatialised account of an important aspect of Australian history – at the intersection of governance, law, architecture, and culture.



# Eco-Active Building Envelopes

In partnership with Sydney Nano Institute

Arianna Brambilla - Associate Professor, Lecturer in Architectural Technology D'Alessandro Deanna - Professor, ARC Future Fellow Martijn de Sterke - Professor, Sydney Nano Institute Daniel Dias Da Costa - Associate Professor, School of Civil Engineering Gustavo Fimbres Weihs - Research Fellow, School of Chemical and Biomolecular Engineering Eugenia Gasparri - Senior Lecturer in Architectural Technologies Anita Ho-Baillie - Professor, John Hooke Chair of Nanoscience, Sydney Nanoscience Hub, School of Physics Faculty of Science Aysu Kuru - Lecturer in Architectural Science Simon Marvin - Professor Chiara Neto - Professor, ARC Future Fellow, Professor of Physical Chemistry Simon Ringer - Professor, Pro-Vice-Chancellor (Research Infrastructure) Alex Song - Senior Lecturer, School of Electrical and Information Engineering

Today, climate change already manifests its effects on the global environment with prolonged and more extreme weather events such as heat waves, droughts, floods, and bushfires. Within the built environment, impacts include increased mortality and morbidity, poor air quality, and scarcity of fresh water supply. An urgent reduction in global carbon emissions is the only viable possibility to mitigate global warming and ensure the survival of our planet's ecosystems.

The construction industry alone accounts for 38% of global CO2 emissions and 35% of total energy consumption. Meanwhile, the current pace of urbanisation, climate change, and slow adoption of mitigation measures all make it likely that cities will face a lack of resources and experience unhealthy environments in the future. In this context, the work here will define a roadmap for the implementation of different nanotechnologies at the building scale. It explores the potentials and limitations of their application in building envelopes by identifying and analysing a comprehensive array of criteria that maximise performance within a circular economy framework.

In dialogue with the United Nations Sustainable Development Goals (UN-SDG), a particular focus is placed on the regenerative design principles of SDG-12 and advancing the Australian manufacturing sector in relation to SDG-9. It will particularly focus on nano-structured coatings that exploit the radiative heat dissipation into deep space, for example. These materials can contribute to reducing the urban heat island effects through passive cooling and promote atmospheric water capture through surface condensation effects.

Metal-organic frameworks for capturing and storing carbon dioxide; bioavailability for food production; materials with advanced photonic and photovoltaic properties for converting solar radiation into useful energy – the various strands of research are all underpinned by the SDGs.





# Seeding the Urban

Chris L. Smith - Professor of Architectural Theory Sophia Maalsen – ARC DECRA Fellow, Senior Lecturer Hannes Frykholm - Rothwell Chair Postdoctoral Associate Leigh-Anne Hepburn - Head of Design, Senior Lecturer in Design Innovation Matthew Gill - Doctoral Candidate, practicing spatial logistician Suzanne Ewing - Professor of Architectural Criticism, University of Edinburgh Matt-Mouley Bouamrane - Chancellor's Fellow in Population Health Sciences and Informatics, University of Edinburgh Moa Carlsson - Lecturer in Architectural Design, University of Edinburgh Miguel Paredes Maldonado - Senior Lecturer in Architectural Design, University of Edinburgh Aidan Mosselson – Global Challenges Chancellor's Fellow, University of Edinburgh Lilv Chi – Associate Professor, Director of Graduate Studies, Cornell University Jesse LeCavalier – Associate Professor in Architecture, Cornell University Anne Weber – Assistant Professor in Landscape, Cornell University Farzin Lofti Jam - Assistant Professor in Architecture, Director of Realtime Urbanism Lab, **Center for Cities, Cornell University** Asya Uzmay – Doctoral Candidate, Cornell University

At the turn of this century the Catalan architect and urbanist Manuel de Solà-Morales suggested that urban environments benefit from "small interventions, which create a ripple, not comprehensive development". Two decades on, cities now house over half the world's population and their health has never been more precarious.

'Seeding the Urban' – a collaboration between the Sydney School of Architecture, Design and Planning, the Edinburgh School of Architecture and Landscape Architecture at University of Edinburgh, UK, and Architecture, Art and Planning at Cornell University in the US – focuses on socially and ecologically strained urban environments. In particular, the focus falls on the capacity for small-scale tactical urban interventions to generate large scale ripples of positive change.

Through an approach to complex situations that requires tightly framed and considered, small-scale interventions, the work will explore and document case studies to develop new knowledge about the impact of this kind of approach. Despite the scale of national and international investment in the multiple ecological and political crises that play out in urban environments, there is relatively little research so far on how novel synergies might foster reparative knowledge. The collaboration here supports a nascent network of international researchers operating in the shared territories of architecture and urbanism, environmental humanities, and ecologically informed, activist practices.

#### Circularity by Design: A Roadmap to Systemic Innovation for the Australian Construction Industry

Arianna Brambilla – Lecturer in Architecture Eugenia Gasparri – Lecturer in Architectural Technologies Paolo Stracchi – Lecturer in Architectural Technologies

The current global construction sector is based on 'take-make-waste' economic models, whereby resources are invested in construction and disposed of at the end of a building's life. In the pursuit of a more sustainable future, these approaches are no longer affordable – timely measures are necessary to address urgent environmental and social challenges.

Building construction practices need a rethink by shifting from linear to circular approaches of design and construction, where resources are re-used, repaired, remanufactured, and/or recycled to limit waste. 'Circularity by Design' is the urgent call to action and this response aims to identify opportunities and barriers for the adoption of circular economy strategies in the Australian construction industry, leading to systemic-radical innovation. The research analyses international best-practice approaches to circularity and scrutinises current practices, giving voice to major stakeholders and key players. Promoting constructive dialogue between academia, industry and policy-makers, the project will define a collaborative roadmap towards sectoral change in Australia – towards the reconciliation between building activities and natural resources.





BUILDING PERFORMANCE

> ARC Discovery Project

#### Reducing the Energy Consumed by Lighting with Gaze-Dependent Illumination

#### Wendy Davis – Honorary Associate Professor Wenye Hu – Associate Lecturer in Architecture

Lighting accounts for approximately 18% of electricity consumption but only a fraction of the light emitted into buildings actually supports occupants' vision – the rest is wasted. With the aim of reducing the energy consumed by lighting, this research will develop strategies for illuminating only the portions of architectural environments that are visible to occupants, thereby reducing unnecessary light. It is set to characterise the impacts of gaze-dependent lighting on energy consumption and the visual environment, while design guidelines will be generated to facilitate the development of innovative lighting systems. It's all directed towards consuming less energy by producing less light, while avoiding negative impacts on the visual experiences of building occupants.

BUILDING PERFORMANCE

> ARC Discovery Project

#### Impact of Work-From-Home Environment on Comfort and Productivity

Jungsoo Kim – Senior Lecturer in Architectural Science, IEQ Lab Richard de Dear – Professor and Director, IEQ Lab

The COVID-19 pandemic has accelerated the trend of 'working from home' (WFH). It's becoming more common for various reasons, such as reducing office rent costs, saving time on commuting, more flexible scheduling, work-life balance, and of course minimising infectious disease transmission. Despite the growing trend – and its expected continuation – there has been no research into workplace health and comfort under the WHF scenario. Indeed, current knowledge of the so-called indoor 'comfort zone' has evolved in the context of commercial office buildings.

Where previously all workplace operating costs were carried by the employer, there is now a trade-off between comfort and energy use in WFH circumstances since workers are paying the utility bills. The project focus is on collecting a unique array of data on occupants' comfort and productivity in relation to indoor environmental quality, as well as the question of how comfort and energy use are balanced in WFH. It will inform Heating, Ventilation and Air Conditioning standards and Australia's housing energy rating schemes. Ultimately, it's about being more relevant and applicable to our 'new normal' in order to improve the quality of working environments.

The central theme is to investigate and quantify the effect of indoor climate on occupant comfort, productivity and residential energy use in WFH settings. Meanwhile, the objectives are multiple – for example, developing a protocol to evaluate home workplaces by simplifying current tools and adapting them for measurement under remote working environments.

Similarly, quantifying the effects of adaptive behaviours on thermal comfort in WFH settings enables us to identify strategies for maintaining comfort while reducing energy and a unique set of indoor data allows for critical evaluation of current standards. It's all directed towards evidence-based recommendations for improving Australia's residential energy rating scheme, understood through the lens of householder energy-consuming behaviours.





Victorian Building Authority Grant

#### Increasing Building Envelope Resilience to Moisture Damage

Arianna Brambilla - Associate Professor, Lecturer in Architectural Technology Eugenia Gasparri - Lecturer in Architectural Technologies Aysu Kuru - Lecturer in Architectural Science

One in three Australian homes suffers from excessive dampness and mould proliferation, a phenomenon exacerbated by inadequate architectural strategies, poor construction practices and bad maintenance. It results from a lack of awareness and knowledge on the topic in construction. The current Australian policy is unable to fully capture the indoor mould growth risk and offer a reliable assessment and design framework, failing to provide an adequate prevention agenda for architects and builders.

In response to mould and condensation issues, the Australian National Construction Code (NCC) introduced mandatory requirements in 2019. Its deem-to-satisfy provisions aim at minimising the risk of condensation but its performance verification method relies on standard assumptions that do not account for increased internal humidity or construction defects, making the research undertaken here all the more urgent and necessary.

Amidst the context of failure and knowledge gaps, the aim is to develop clear guidelines for the design and construction of resilient building envelopes. The work will include a catalogue of climate-specific build-ups, with quantified hygrothermal performance and examples of 2D detailing accompanied by a bi-dimensional analysis of moisture transport.

#### Hotel Quarantine and Airborne Transmission

Richard de Dear – Professor and Director, IEQ Lab Jungsoo Kim – Senior Lecturer in Architectural Science, IEQ Lab Jing Xiong – Technical Officer, Manager, and Research Associate, IEQ Lab

COVID-19 has prompted all of us to reconsider the importance of health, and the Indoor Environmental Quality (IEQ) Lab is no exception. The World Health Organisation has conceded that microscopic aerosols containing SARS-CoV-2 represent the main pathway of infection. Acknowledging airborne transmission raises an urgent need to more comprehensively understand how air moves and anthropogenic aerosols disperse within buildings.

In this light, the IEQ Lab is conducting research on the ventilation performance and airflow patterns of spaces, including open-plan offices and quarantine hotels. We study spatial dispersion patterns of tracer gas injected into the exhaled breath of an index patient, for example, represented by a full-scale, 'breathing' thermal mannequin. An 'airborne infection iso-risk' floorplate map for a variety of index patient locating scenarios is just one outcome, potentially useful for spatially arranging office workstations and hotel quarantine rooms



HexBox Canopy, an intensive workshop collaboration between the School of Architecture, Design and Planning and TU Kaiserslautern.

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